(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 710 649 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
18.03.2015 Bulletin 2015/12

(21) Application number: **12785838.9**

(22) Date of filing: **16.05.2012**

(51) Int Cl.:
G03G 15/08 *(2006.01)*

(86) International application number:
PCT/US2012/038086

(87) International publication number:
WO 2012/158761 (22.11.2012 Gazette 2012/47)

(54) **MULTIPLE STIFFNESS SEAL FOR IMAGING COMPONENT SURFACES**

STEIFE MEHRFACHDICHTUNG FÜR OBERFLÄCHEN VON BILDGEBUNGSKOMPONENTEN

EMBOUT D'ÉTANCHÉITÉ À RIGIDITÉS MULTIPLES POUR SURFACES D'ÉLÉMENT DE FORMATION D'IMAGES

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **18.05.2011 US 201113110741**

(43) Date of publication of application:
26.03.2014 Bulletin 2014/13

(73) Proprietor: **Lexmark International, Inc.**
Lexington, KY 40550 (US)

(72) Inventors:
- **BROWN, Stephen, Andrew**
  Lyndhurst
  OH 44124 (US)
- **GIBSON, Nicholas, Fenley**
  Lexington
  KY 40611 (US)

(74) Representative: **Börner, Robert et al**
Murgitroyd & Company
Scotland House
165-169 Scotland Street
Glasgow G5 8PL (GB)

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Description

BACKGROUND

1. Field of the Disclosure

[0001] The present disclosure relates to seals which may be used in an image forming apparatus. The seals may prevent the leakage of image forming materials, e.g., as between components and a housing in the image forming device. The image forming apparatus may include an electrophotographic device, ink printer, copier, fax, all-in-one device or multifunctional device.

2. Description of the Related Art

[0002] An image forming device, such as an electrophotographic device, ink printer, copier, fax, all-in-one device or multi-functional device may use developing agents such as toner or ink, which are stored in a cartridge and may be disposed on media to form an image. The developing agent, such as toner, may be fixed to the media using an image fixing apparatus, which may apply heat and/or pressure to the toner. Leakage of the toner from the cartridge may occur as it may be difficult to seal gaps between a rotating roll, a cleaning or doctor blade and the housing of the cartridge. Seals may be provided to effectively close the gaps and prevent toner leakage. Positioning of the roll against the seal and tolerance stack-up of the various mating components may create uneven stress and a non-uniform temperature profile. At higher printing speeds, heat may be generated due to the compression of the seal against the rotating roll causing the toner to melt. Design of the seal may therefore be an important factor in cartridge life.

[0003] Shown in Figures 1, 1A and IB is a prior art seal 10. Seal 10 comprises a head 12, a toe 14, a rotary seal portion 16, a blade seal portion 20, a flap seal portion 22. A sealing surface 24 has a plurality of angled grooves 25 within the rotary seal portion 16. Blade seal portion 20 effects a seal between a doctor blade, a developer roll and a nip therebetween. Flap seal portion 22 effects a seal between a developer roll, a flap seal that runs along the length of the developer roll and a nip therebetween. To seal the two nips, projecting ribs 28 are provided on biasing surface 26. A feature of the ribs 28 is that they provide a uniform compressive force along their length. This is an effective design in systems having print speeds of 30 to 50 ppm (pages per minute) and lower. The seal 10 is designed to have sufficient compressive force to seal the two nips which requires a higher force than for example the force needed to seal along the developer roll within the rotary seal section 16. As printing speeds increase to even higher rates, for example 70-100 ppm, such a design using uniform compressive force produces unwanted frictional forces and heat along the rotary seal portion 16 of the seal 10. This unwanted heat may cause banding of the developer roll, or melting or agglomeration of the toner within an imaging apparatus leading to print defects. Whilst the disclosure of US 7 623 807 B2 (Carter, II, et al.) provides a rib arrangement on a seal which provides a substantially uniform contact pressure along its sealing surface to within +/- 15% of the total contacting pressure,it would nevertheless be advantageous to have a seal having areas of higher compressive force where needed such as at the nip locations and areas of lower compressive force where it is not required to provide an effective seal.

SUMMARY

[0004] A sealing member for sealing between a roll and at least one printer component, comprises a first surface to be engageable with the roll and the at least one printer component, the roll and the at least one printer component forming a nip region therebetween, the first surface including at least one groove, a first portion of the first surface engageable with a corresponding portion of the roll at a first contact pressure; and a second surface biasing the first surface to engage with the roll and the at least one printer component, a first portion of the second surface providing the first contact pressure in a substantially uniform manner along the first portion of the first surface, wherein a nip region portion of the first surface abutting an end of the first portion of the first surface and engaging the roll and the at least one printer component along said nip region at a second contact pressure; and a nip region portion of the second surface providing the second contact pressure along the nip region portion of the first surface that is greater than the first contact pressure, and wherein the second surface includes a pair of projecting ribs, each rib having a first stiffness along the first portion of the second surface to provide the first contact pressure and a second stiffness along the nip region portion of the second surface that is greater than the first stiffness to provide the second contact pressure. Various pressure profiles along the length of the sealing member can be achieved. The second contact pressure may be 1.5 to 5 times as great as the first contact pressure.

[0005] The projecting ribs may define an angle between said projecting ribs of about 1 to 179 degrees. The stiffness of the projecting ribs at the various portions along the seal may be varied up or down by altering the cross-sectional of the ribs by thickening or thinning. Also transverse ribs extending between each rib and the second surface may be used to increase stiffness and hence contact pressure. The first surface of the seal member may contain a plurality of grooves having different orientations along portions of the seal surface.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] The detailed description below may be better understood with reference to the accompanying figures which are provided for illustrative purposes and are not to be considered as limiting any aspect of the invention.

Figure 1 is an illustration of a prior art seal showing in Figure 1A the sealing surface and in Figure IB the biasing surface.

Figure 2 is a view of an exemplary seal (hidden) in an exemplary frame with a developer roll installed.

Figure 3 is the view of Figure 2 with the developer roll removed from the frame to expose the exemplary seal.

Figure 4 is an end view of the exemplary seal, developer roll, doctor blade and flap seal within a frame.

Figure 5 is an illustration of the exemplary seal showing in Figure 5A the sealing surface and in Figure 5B the biasing surface.

Figure 6 is a section view taken along line 6-6 of Figure 5 showing a first stiffness section in a rotary seal portion.

Figure 7 is a section view taken along line 7-7 of Figure 5 showing a second stiffness section in a nip region.

Figures 8A and 8B illustrate the use of two versions of transverse stiffening ribs for use in the exemplary seal.

Figure 9 illustrates a schematic representation of an end seal along with uniform and varied contact pressure profiles.

DETAILED DESCRIPTION

[0007] The present disclosure relates to end seals which may be used between component surfaces, such as component surfaces in an image forming apparatus. The end seals may prevent the leakage of toner, e.g. as between a blade and a housing, between a roll and a flap seal, or between a roll and a frame in the image forming apparatus. The blade may be a "doctor blade" which controls the thickness of image forming material on a given surface, such as a roll surface. The roll may specifically include a developer roll which supplies toner to a photosensitive drum. The end seals may also prevent the leakage of toner between the developer roll and a flap seal that also extend along the length of the developer roll. In particular, the end seals may prevent leakage at the nip between the roll and abutting devices such as the doctor blade or the nip between the roll and the flap seal by providing increased compressive forces within a region about the nip locations.

[0008] With reference first to Figures 2 -4, an exemplary end seal 50 is illustrated that may be disposed in the frame 40. Frame 40 may be in a toner cartridge of an image forming apparatus or within a developer unit contained within an image forming apparatus. The end seal 50 may be compressed between a mating surface 41 (see Figure 4) formed at each end in the frame 40 to contain end seal 50 and an end portion 43 of a developer roll 42, an end portion 45 of a doctor blade 44, and an end portion 49 of a flap seal 48. It will be realized that a mirror image seal is provided at the other ends of these components that are mounted on frame 40. Figure 2 is a front view showing placement of the exemplary developer roll 42, a doctor blade 44 and a flap seal 48 within frame 40. Doctor blade 44 is illustrated as being affixed to frame 40 using several screws 46 provided along the length of doctor blade 44. Other forms of attaching doctor blade 44 to the frame 40 may also be used. Flap seal 48 is a generally rectangular seal made of a polyester film such as MYLAR™ or similar material, is approximately 0.1mm thick, and is used to prevent toner from leaking along the line of the nip between developer roll 42 and frame 40. Pegs (not shown) may be provided on frame 40 intermediate the ends of flap seal 48 which align with corresponding openings in flap seal 48 to aid in retaining flap seal 48 in place along the length of developer roll 42. In addition to or in lieu of the pegs, an adhesive may be used to affix flap seal 48 to frame 40 to seal a potential leak path for toner between flap seal 48 and frame 40.

[0009] Figure 3 is a view of Figure 2 with developer roll 42 removed so that end seal 50 may be seen more clearly mounted on mating surface 41 along with its position in relation to the end 45 of doctor blade 44 and the end 49 of flap seal 48. Figure 4 is a side view of exemplary end seal 50 mounted in the frame 40, as well as developer roll 42, doctor blade 44, and flap seal 48. In addition, a plurality of grooves 90 whose function are described herein are also seen in this figure.

[0010] The interference of the developer roll 42, doctor blade 44 and flap seal 48 to the end seal 50 may be determined by the positions of the roll 42, doctor blade 44 and flap seal 48, respectively. Depending on the amount of interference, which may be due primarily to the positioning and/or to the tolerance stack-up of various components, higher speeds of printing may result in high temperatures and melting of the toner. This build-up of heat may be further exacerbated by the composition of the roll surface and end seal, both often made of relatively soft elastomers. Melted toner may then wedge between the doctor blade 44 and developer roll 42 or between the developer roll 42 and flap seal 48 which may lead to printer malfunction or failure.

[0011] Figure 5 is a more detailed illustration of the exemplary end seal 50. At respective ends of the illustrated end seal 50 is a head 52 and a toe 54. The head 52, that will be positioned between the end 45 of doctor blade 44 and frame 40, and the toe 54 are used to position end seal 50 along mating surface 41 in frame 40 and along the ends 43, 45, and 49 of developer roll 42, doctor blade 44, and flap seal 48, respectively. A first surface 56, also referred to as a sealing surface 56, and a second surface 58, also referred to as a biasing surface 58, in-

terconnect head 52 and toe 54. Sealing surface 56 may have at least one groove or a plurality of grooves extending along its length. A first portion 60 of sealing surface 56, also referred to as a rotary seal portion 60, engages with and seals a corresponding portion of the end 43 of developer roll 42 at a first contact pressure. Sealing surface 56 further includes a nip region portion abutting one end of the first portion 60, e.g. one end of rotary seal portion 60, that corresponds to the nip region formed between the end 43 of developer roll 42 and the end 45 of doctor blade 44 or between the developer roll and the end 49 of flap seal 48. As illustrated in Figure 5, two nip region portions 62, 64 are shown. Nip region portion 62 corresponds to the nip region of the end 43 of developer roll 42 and the end 45 of doctor blade 44 while nip region portion 64 corresponds to the nip region of the end 43 of developer roll 42 and the end 49 of flap seal 48. Nip region portion 62-1 refers to the nip region portion 62 that is on the first or sealing surface 56, while nip region portion 62-2 refers to the nip region portion 62 on the second surface or biasing surface 58; similarly for nip region portions 64-1 and 64-2 of nip region portion 64. Where only one component is provided in contact with developer roll 43, only one nip region portion would be provided within end seal 50. As described herein, the contact pressures in the nip region portions 62, 64, that is a second contact pressure and or a third contact pressure, are greater than the first contact pressure occurring along the first portion 60 of sealing surface 56. The second and third contact pressures may be equal or may be different, but each are greater than the first contact pressure.

[0012] The second or biasing surface 58, is used to provide the first contact pressure within a first portion 68 of the second surface 58 corresponding to the first portion 60 of the first surface and the second and third contact pressures in the nip region portions 62, 64. Provided along second surface 58 is a pair of projecting ribs 66-1, 66-2. When end seal 50 is inserted into frame 40, the projecting ribs 66-1, 66-2 act to compress sealing surface 56 against the developer roll 42 and the ends 45, 49 of the other printer components, doctor blade 44 and flap seal 48. Various embodiments as discussed herein may be used to achieve the first contact pressure and the second and third contact pressures.

[0013] Shown in Figures 6 and 7 are two sectional views of end seal 50 taken along lines 6-6 and 7-7 shown in Figure 5A. Figure 6 shows a section view through the first portion 60 of the first surface 56 and a first portion 68 of the second surface 58. Figure 7 shows a section through the nip region portion 62 of the end seal 50. As illustrated in Figure 7, the section of the ribs 66-1 and 66-2 along the second surface or biasing surface 58 is thicker than the section of the ribs 66-1, 66-2 in first portion 68 of the second surface 58 shown in Figure 6. Accordingly, the portions of the ribs 66-1, 66-2 within nip region portion 62-2 on the second surface 58 are stiffer than the portions of the ribs 66-1, 66-2 within the first portion 68 of the second surface 58. Because the portions of the ribs 66-1, 66-2 within nip region portion 62-2 on the second surface 58 is stiffer, they exert a greater contact pressure within the nip region portion 62. The portions of ribs 66-1, 66-2 within nip region portion 64-2 are made stiffer in a similar fashion than the portions of the ribs 66-1, 66-2 within the first portion 68 of the second surface 58. The shape and stiffness of the ribs in each of the nip regions 62, 64 is dependent on the contact pressure or force needed to seal the nip 70 between the end 45 of doctor blade 44 and the end 43 of developer roll 42 or at the nip 72 between the end 49 of flap seal 48 and the end 43 of developer roll 42. The transition in the shape of ribs 66-1, 66-2 from the first portion 68 of the second surface 58 into nip regions 62-2, 64-2 may be a continuous and smooth transition or may be a discontinuous transition by having the ribs step outwardly to broaden them.

[0014] The ribs 66-1, 66-2 may define an angle 0 which may have a value of between about 1 to 179 degrees, including all values and increments therebetween. For example, 0 may have a value of between about 30 to 160 degrees. In addition, in the exemplary illustration, the ribs 66-1, 66-2 may be positioned such that they do not converge toward one another when projecting from the second surface 58 of the end seal 50.

[0015] Shown in Figures 8A and 8B, are alternate embodiments for providing greater contact pressure or higher stiffness in nip regions 62, 64 than along the first portions 60, 68 of first and second surfaces 56, 58, respectively. Shown are transverse ribs; generally indicated at 80, that interconnect the side of each of ribs 66-1, 66-2 to second surface 58, thereby providing localized increased stiffness. The transverse ribs 80 are used to increase the stiffness of ribs 66-1, 66-2 within the nip region portions 62, 64. A transverse rib 80 may be aligned with each of nips 70, 72 or may be placed on each side of where the nips 70, 72 are located, or at other locations within the nip region portions 62-2, 64-2 or elsewhere along the end seal 50 to achieve the desired contact pressure profile across the nip regions 62, 64 or elsewhere along the end seal. Of course, the desired contact pressure profile across the nip region portions 62, 64 may also be achieved by varying the cross section of the ribs 66-1, 66-2 or by a combination of varying rib cross section along with providing one or more transverse ribs.

[0016] Two illustrative forms of transverse rib 80 are shown although other shapes and designs may be used to achieve the same goal of increasing stiffness and hence contact pressures in the nip regions 62, 64 of the doctor blade 44 and flap seal 48, respectively, over the contact pressure applied to the developer roll end 43 within first portion 60. Transverse rib 82 is in the form of a gusset or triangle that interconnects the side of each of the ribs 66-1, 66-2 to the second surface 58. Transverse rib 84 is in the form of an L, having one leg along the side of each of the ribs 66-1, 66-2 and another leg connected to second surface 58. Transverse ribs 82, 84 are illustrated as being molded. Transverse ribs 82, 84 may be

later added using adhesive in which case ribs 82, 84 may be formed of other materials as are known to one of skill in the art to achieve the desired stiffness and contact pressures.

[0017] The end seal 50 may comprise a molded (e.g., injection molded or compression molded) part made of a polymeric based elastomeric material. One suitable material is SANTOPRENE™, a thermoplastic vulcanizate, which provides performance similar to vulcanized rubber, such as flexibility (e.g., 35 Shore A to 50 Shore D including all increments and values therebetween). In addition, the end seal material may have relatively low compression set along with the processing capability of a thermoplastic resin. In addition, the material selected for the end seal 50 may provide continued sealing performance through heat and cold (-60 °C to 135 °C) along with resistance to fatigue, as well as oils, greases and a variety of acids and base compounds.

[0018] The first surface 56 may include what may be described as saw tooth type ribs forming grooves 90. Within the first portion or rotary seal portion 60, the grooves 90 may run at an angle to the process direction of the developer roll 42, at angles ranging from about 1 degree to about 45 degrees (preferably about 10 degrees) with respect to the sides of the end seal 50. The grooves 90 may therefore be arranged to move toner from the end 43 of the developer roll 42 toward the middle. By positioning the grooves in this way, they act to push toner away from the end 43 of the developer roll 42. The height of the ribs forming the grooves 90 generally may range from about 0.05 to about 0.5 mm, preferably about 0.1 mm, including all values and increments therein. The width of the ribs generally may range from about 0.01 to about 0.5 mm, preferably about 0.2 mm, also including all values and increments therein. As illustrated the groves 90 extend through nip region 64- 1 but are redirected to be parallel to the sides of end seal 50. As can be seen in Figure 3, the end 49 of flap seal 48 is tapered outwardly forming a tapered nip 72. Redirecting the grooves 90 within the nip region 64-1 to be parallel to the sides of the end seal 50 ensures that the tapered nip 72 intersects with the peaks of the grooves 90 ensuring that a seal is maintained along the tapered nip 72.

[0019] The end seal 50 also may also include a blade seal portion 94 for sealing the space formed between the frame 40 and the doctor blade 44. The blade seal portion 94 further includes a plurality of ribs 95 that are deeper and more widely spaced than grooves 90 and which are also parallel to the sides of end seal 50. Figure 7 illustrates a section view of exemplary ribs 95. The height of the ribs 95 may range from about 0.2 mm to about 1.5 mm, preferably about 0.7 mm, including all values and increments therein. The width of the ribs may range from about 0.2 mm to about 1.0mm, preferably about 0.5 mm, also including all values and increments therein. The ribs 95 may extend into the nip region portion 62-1. In prior art designs the blade seal portion 94 was generally a flat surface. The ribs 95 advantageously provide a multiplicity of sealing contacts with the end 45 of the doctor blade 44 that make it more difficult for a toner leak path to form across the width of the blade seal portion 94 between the blade seal portion 94 and the end 45 of the doctor blade 44 as compared to the flat surfaced blade seal portions of prior designs. Ribs 95 also act to increase the compliance of the blade seal portion 94.

[0020] It can now be appreciated that the end seal 50 may therefore provide a more optimized contact pressure distribution resulting in a lower temperature distribution than when a substantially uniform contact pressure is provided, particularly at relatively high printing speeds. Encroachment upon temperatures that would be sufficient to initiate melting or some level of flow of any one or more of the constituents of the toner (e.g., polymer resin, colorant, wax, inorganic salts) may be avoided.

[0021] Attention is directed to Figure 6 where grooves 90 can be seen. The grooves may include one or a plurality of substantially vertical wall components 92 which may engage with a surface of the doctor blade 44 and/or developer roll 42. As illustrated, wall components 92 may form a substantially perpendicular angle when projecting the vertical wall component in a "y" direction and intersecting an "x" plane. The "x" plane may therefore be representative of a sealing surface. However, in the context of the present invention, the angle may be any angle greater than 45 degrees and less than 135 degrees, including all increments and values therebetween. For example, the angle may have a value of between 75-105 degrees, or may have a specific value of about 90 degrees. In addition, it has been found that such a wall design, when utilized in an image forming apparatus containing toner, and engaging a developer roller surface, may better serve to resist migration of toner between the grooves 90 away from the toner sump which thereby may further limit toner leakage.

[0022] Figure 9 illustrates relative contact pressure profiles provided by an end seal. A schematic representation of an end seal 100 is shown. End seal 100 comprises a doctor blade seal portion 102, a nip region 104 for a doctor blade, a rotary seal portion 106, a nip region 108 for a flap seal and a flap seal portion 110. Curves A, B C and D represent relative contact pressure profiles across seal 100.

[0023] Curve A represents a substantially uniform contact pressure profile across the entirety of seal 100 as would be exhibited by prior art seal 10.

[0024] Curves B C and D represent relative contact pressure profiles for embodiments of end seal 50 that illustrate the rib stiffening by increasing sectional dimensions within each of the two nip regions 104, 108, by use of one or more transverse stiffening ribs within nip regions 104, 108 of the exemplary end seal 50, or by the combination of increasing sectional dimensions and using transverse ribs.

[0025] Curve B shows a contact pressure peak at 120 and again at 122, which represents the respective nip locations 70, 72 between the doctor blade 44 and devel-

oper roll 42 and between the flap seal 48 and developer roll 42 of end seal 50. The contact pressure peak at 122 is illustrated as being less than that at 120. As illustrated, the increase in both contact pressures is shown as occurring within the nip regions 104, 108. One reason for the contact pressure peak 122 having a lower value is that the nip 72 between the flap seal 48 and developer roll 42 may be smaller and require less contact pressure to effect a seal.

[0026] Curve C shows a contact pressure plateau at 124 and again at 126, which spans across the respective nip locations 70, 72 between the doctor blade 44 and developer roll 42 and between the flap seal 48 and developer roll 42 of end seal 50. The pressure plateau at 126 is illustrated as being about equal to that at 124 which is a matter of design choice. As illustrated at 128, the increase in contact pressure in nip region 104 is shown as beginning within blade seal portion 102 a short distance from nip region 104. The contact pressure decreases at 130 and returns to a lower contact pressure within a short distance from rotary seal portion 106. A similar increase and decrease outside of the nip region 108 in rotary seal portion 106 and flap seal portion 110, respectively is again shown for contact pressure plateau 126. Also illustrated in Curve C at 132, is a reduction in the contact pressure of flap seal portion 110 that may be achieved by thinning ribs 66-1, 66-2.

[0027] Unlike Curves B and C where the contact pressure is reduced in the blade seal portion 102 and flap seal portion 110, Curve D illustrates, at 140, higher contact pressures across blade seal portion 102 and nip region portion 104 and across flap seal nip region 108 and flap seal portion 110 that each respectively decrease at 142, 144, to a lower contact pressure in the rotary seal portion 106. While the contact pressure profiles across blade seal portion 102, rotary seal portion 106 in Curves B, C and D are as illustrated as being relatively the same magnitude, these contact pressure profiles in these portions of the end seal 50 may be different from each other by stiffening or thinning the ribs 66-1, 66-2 to achieve the desired contact pressures and contact pressure profile. Contact pressures with the nip regions 104, 108, as well as blade seal portion 102 and flap seal portion 110, may be between 1.5 to 5 times, and preferably 2 times, the magnitude of the contact pressure in rotary seal portion 106. For example, the contact pressure along rotary seal portion 106 has been calculated to be in the range of about 0.0031 MPa to about 0.053 MPa while the contact pressure in nip regions 104, 108, and or as blade seal portion 102 and flap seal portion 1 10, has been calculated to be in a corresponding range of 0.0049 MPa to about 0.22 MPa. The contact pressures have been estimated using finite element analysis because the small size of the seal when mounted in its mating surface makes its unwieldy and difficult to perform actual contact pressure measurements.

[0028] By application of the principles described herein, various combinations of pressure profiles within or across the multiple portions of the end seal 50 may be achieved to accommodate a wide variety of designs in doctor blades, developer rolls, and or flap seals.

[0029] Although the end seal 50 has been illustrated using the specific embodiments described herein, the end seal 50 is intended to encompass seals as broadly described herein, including all equivalent structures of those specifically described in the present application. However, it should be apparent that changes and modifications may be resorted to without departing from the spirit and scope of the invention.

Claims

1. A sealing member (50) for sealing between a roll (42) and at least one printer component (44), comprising:

a first surface (56) engageable with the roll and the at least one printer component, the roll and the at least one printer component forming a nip region (62, 64) therebetween, the first surface including at least one groove (90), a first portion (60) of the first surface engageable with a corresponding portion of the roll at a first contact pressure; and

a second surface (58) biasing the first surface (56) to be engageable with the roll and the at least one printer component, a first portion (68) of the second surface providing the first contact pressure in a substantially uniform manner along the first portion (60) of the first surface (56);

characterised in that

a nip region portion (62-1) of the first surface abuts an end of the first portion (60) of the first surface (56) and is engageable with the roll and the at least one printer component along said nip region (62) at a second contact pressure;

and a nip region portion (62-2) of the second surface providing the second contact pressure along the nip region portion (62-1) of the first surface that is greater than the first contact pressure, and

wherein the second surface (58) includes a pair of projecting ribs (66-1, 66-2), each rib having a first stiffness along the first portion (68) of the second surface to provide the first contact pressure and a second stiffness along the nip region portion (62-2) of the second surface that is greater than the first stiffness to provide the second contact pressure.

2. The sealing member of claim 1, wherein a portion of each rib (66-1, 66-2) along the first portion (68) of the second surface (58) has a cross-sectional area that is less than the cross sectional area of a portion of each rib along the nip region portion (62-2) of the

second surface.

3. The sealing member of claim 2, wherein the cross sectional area of each rib (66-1, 66-2) in the nip region portion (62-2) is greatest about a nip formed between the roll (42) and the at least one printer component (44) within the nip region.

4. The sealing member of claim 3, wherein the cross sectional area of each rib (66-1, 66-2) within the nip region portion (62-2) of the second surface (58) gradually increases in size from the abutment of the nip region portion of the second surface with the first portion (68) of the second surface to a maximum size at about the nip.

5. The sealing member of claim 1, further comprising at least one transverse rib (80) within the nip region portion (62-2) of the second surface (58) interconnecting one of said projecting ribs (66-1, 66-2) with the second surface.

6. The sealing member of claim 5, wherein the at least one transverse rib (80) comprises two transverse ribs (82, 84) spaced apart on opposite sides of the nip (62), each of the two transverse ribs interconnecting said one of said projecting ribs (66-1, 66-2) with the second surface (58).

7. The sealing member of claim 5, wherein the at least one transverse rib (80) comprises two transverse ribs (66-1, 66-2), a first of the two transverse ribs interconnecting a first of said projecting ribs with the second surface and a second of the two transverse ribs interconnecting a second of said projecting ribs with the second surface.

8. The sealing member of claim 1, wherein the at least one groove (90) of the first surface (56) is angled with respect to the sides of the first portion (60) of the first surface to urge toner away from an end (43) of the roll (42) during roll rotation and is parallel to the sides of the nip region portion (62-1) of the first surface (56).

9. The sealing member of claim 1, wherein the second contact pressure is between 1.5 to 5 times greater than the first contact pressure.

10. The sealing member of claim 1, wherein:

the first surface (56) is further to be engageable with the roll (42) and a second printer component (48), the roll and the second printer component forming a second nip region (64) therebetween, a second nip region portion (64-1) of said first surface abutting a second end of the first portion (60) of the first surface and engageable with the roll (42) and the second printer component (48) along the second nip region (64) at a third contact pressure; and

the second surface (58) further biasing the first surface (56) to be engageable with the roll (42) and the second printer component (48), a second nip region portion (64-2) of the second surface providing the third contact pressure along the second nip region portion (64-1) of the first surface that is greater than the first contact pressure.

11. The sealing member of claim 10, wherein each rib (66-1, 66-2) further having a third stiffness along the second nip region portion (64-2) of the second surface (58) that is greater than the first stiffness to provide the third contact pressure, and wherein within the first nip region portions (62-1, 62-2) of the first and second surfaces (56, 58) at least one transverse rib (80) interconnects each projecting rib with the second surface (58), and within the second nip region portions (64-1, 64-2) of the first and second surfaces (56, 58) at least one other transverse rib (80) interconnects each projecting rib with the second surface (58).

12. The sealing member of claim 10, wherein the at least one groove (90) of the first surface (56) is angled with respect to the sides of the first portion (60) of the first surface to urge toner away from an end (43) of the roll (42) during roll rotation and is parallel to the sides of the first nip region portion (62-1) and second nip region portion (64-1) of the first surface.

13. The sealing member of claim 1, located within a printer cartridge.

Patentansprüche

1. Ein Dichtelement (50) zum Abdichten zwischen einer Walze (42) und mindestens einer Druckerkomponente (44), beinhaltend:

eine erste Oberfläche (56), die mit der Walze und der mindestens einen Druckerkomponente in Eingriff gebracht werden kann, wobei die Walze und die mindestens eine Druckerkomponente einen Walzenspaltbereich (62, 64) dazwischen bilden, wobei die erste Oberfläche mindestens eine Rille (90) umfasst, wobei ein erster Abschnitt (60) der ersten Oberfläche mit einem entsprechenden Abschnitt der Walze bei einem ersten Berührungsdruck in Eingriff gebracht werden kann; und

eine zweite Oberfläche (58), welche die erste Oberfläche (56) derart beeinflusst, dass sie mit der Walze und mit mindestens einer Drucker-

komponente in Eingriff gebracht werden kann, wobei ein erster Abschnitt (68) der zweiten Oberfläche den ersten Berührungsdruck in einer im Wesentlichen gleichförmigen Weise entlang dem ersten Abschnitt (60) der ersten Oberfläche (56) bereitstellt;

dadurch gekennzeichnet, dass

ein Walzenspaltbereichsabschnitt (62-1) der ersten Oberfläche an ein Ende des ersten Abschnitts (60) der ersten Oberfläche (56) anstößt und in die Walze und die mindestens eine Druckerkomponente entlang dem Walzenspaltbereich (62) bei einem zweiten Berührungsdruck in Eingriff gebracht werden können;

und ein Walzenspaltbereichsabschnitt (62-2) der zweiten Oberfläche den zweiten Berührungsdruck entlang dem Walzenspaltbereichsabschnitt (62-1) der ersten Oberfläche bereitstellt, welcher stärker als der erste Berührungsdruck ist, und

wobei die zweite Oberfläche (58) ein Paar vorspringender Rippen (66-1, 66-2) umfasst, wobei jede Rippe eine erste Steifigkeit entlang dem ersten Abschnitt (68) der zweiten Oberfläche, um den ersten Berührungsdruck bereitzustellen, und eine zweite Steifigkeit entlang dem Walzenspaltbereichsabschnitt (62-2) der zweiten Oberfläche, die stärker als die erste Steifigkeit ist, um den zweiten Berührungsdruck bereitzustellen, aufweist.

2. Dichtelement gemäß Anspruch 1, wobei ein Abschnitt jeder Rippe (66-1, 66-2) entlang dem ersten Abschnitt (68) der zweiten Oberfläche (58) eine Querschnittsfläche aufweist, die kleiner als die Querschnittsfläche eines Abschnitts jeder Rippe entlang dem Walzenspaltbereichsabschnitt (62-2) der zweiten Oberfläche ist.

3. Dichtelement gemäß Anspruch 2, wobei die Querschnittsfläche jeder Rippe (66-1, 66-2) in dem Walzenspaltbereichsabschnitt (62-2) um einen Walzenspalt herum, welcher zwischen der Walze (42) und der mindestens einen Druckerkomponente (44) in dem Walzenspaltbereich gebildet ist, am größten ist.

4. Dichtelement gemäß Anspruch 3, wobei die Querschnittsfläche jeder Rippe (66-1, 66-2) in dem Walzenspaltbereichsabschnitt (62-2) der zweiten Oberfläche (58) allmählich von dem Anstoßen des Walzenspaltbereichsabschnitts der zweiten Oberfläche an den ersten Abschnitt (68) der zweiten Oberfläche bis zu einer maximalen Größe an ungefähr dem Walzenspalt an Größe zunimmt.

5. Dichtelement gemäß Anspruch 1, ferner beinhaltend mindestens eine Querrippe (80) in dem Walzenspaltbereichsabschnitt (62-2) der zweiten Oberfläche (58), die eine der vorspringenden Rippen (66-1, 66-2) mit der zweiten Oberfläche verbindet.

6. Dichtelement gemäß Anspruch 5, wobei die mindestens eine Querrippe (80) zwei Querrippen (82, 84) beinhaltet, die auf gegenüberliegenden Seiten des Walzenspalts (62) mit Abstand angeordnet sind, wobei jede der zwei Querrippen die eine der vorspringenden Rippen (66-1, 66-2) mit der zweiten Oberfläche (58) verbindet.

7. Dichtelement gemäß Anspruch 5, wobei die mindestens eine Querrippe (80) zwei Querrippen (66-1, 66-2) beinhaltet, wobei eine erste der zwei Querrippen eine erste der vorspringenden Rippen mit der zweiten Oberfläche verbindet und eine zweite der zwei Querrippen eine zweite der vorspringenden Rippen mit der zweiten Oberfläche verbindet.

8. Dichtelement gemäß Anspruch 1, wobei die mindestens eine Rille (90) der ersten Oberfläche (56) hinsichtlich der Seiten des ersten Abschnitts (60) der ersten Oberfläche abgewinkelt ist, um während der Walzendrehung Toner von einem Ende (43) der Walze (42) weg zu treiben und parallel zu den Seiten des Walzenspaltbereichsabschnitts (62-1) der ersten Oberfläche (56) liegt.

9. Dichtelement gemäß Anspruch 1, wobei der zweite Berührungsdruck zwischen 1,5- bis 5-mal stärker als der erste Berührungsdruck ist.

10. Dichtelement gemäß Anspruch 1, wobei:

die erste Oberfläche (56) ferner mit der Walze (42) und einer zweiten Druckerkomponente (48) in Eingriff gebracht werden kann, wobei die Walze und die zweite Druckerkomponente einen zweiten Walzenspaltbereichsabschnitt (64) dazwischen bilden, ein zweiter Walzenspaltbereichsabschnitt (64-1) der ersten Oberfläche an ein zweites Ende des ersten Abschnitts (60) der ersten Oberfläche anstößt und mit der Walze (42) und der zweiten Druckerkomponente (48) entlang dem zweiten Walzenspaltbereich (64) bei einem dritten Berührungsdruck in Eingriff gebracht werden kann; und

die zweite Oberfläche (58) ferner die erste Oberfläche (56), die mit der Walze (42) und der zweiten Druckerkomponente (48) in Eingriff gebracht werden soll, beeinflusst, wobei ein zweiter Walzenspaltbereichsabschnitt (64-2) der zweiten Oberfläche entlang dem zweiten Walzenspaltbereichsabschnitt (64-1) der ersten Oberfläche den dritten Berührungsdruck bereitstellt, welcher stärker als der erste Berührungsdruck ist.

11. Dichtelement gemäß Anspruch 10, wobei jede Rippe

(66-1, 66-2) ferner eine dritte Steifigkeit entlang dem zweiten Walzenspaltbereichsabschnitt (64-2) der zweiten Oberfläche (58) aufweist, die stärker als die erste Steifigkeit ist, um den dritten Berührungsdruck bereitzustellen, und wobei in den ersten Walzenspaltbereichsabschnitten (62-1, 62-2) der ersten und zweiten Oberfläche (56, 58) mindestens eine Querrippe (80) jede vorspringende Rippe mit der zweiten Oberfläche (58) verbindet, und in den zweiten Walzenspaltbereichsabschnitten (64-1, 64-2) der ersten und zweiten Oberfläche (56, 58) mindestens eine andere Querrippe (80) jede vorspringende Rippe mit der zweiten Oberfläche (58) verbindet.

12. Dichtelement gemäß Anspruch 10, wobei die mindestens eine Rille (90) der ersten Oberfläche (56) hinsichtlich der Seiten des ersten Abschnitts (60) der ersten Oberfläche abgewinkelt ist, um während der Walzendrehung Toner von einem Ende (43) der Walze (42) weg zu treiben und parallel zu den Seiten des ersten Walzenspaltbereichsabschnitts (62-1) und des zweiten Walzenspaltbereichsabschnitts (64-1) der ersten Oberfläche liegt.

13. Dichtelement gemäß Anspruch 1, das sich in einer Druckerpatrone befindet.

Revendications

1. Un élément d'étanchéisation (50) pour l'étanchéisation entre un cylindre (42) et au moins un composant d'imprimante (44), comprenant :

une première surface (56) pouvant se mettre en prise avec le cylindre et cet au moins un composant d'imprimante, le cylindre et cet au moins un composant d'imprimante formant une région d'espacement (62, 64) entre ceux-ci, la première surface incluant au moins une rainure (90), une première portion (60) de la première surface pouvant se mettre en prise avec une portion correspondante du cylindre à une première pression de contact ; et
une deuxième surface (58) décalant la première surface (56) devant pouvoir se mettre en prise avec le premier cylindre et cet au moins un composant d'imprimante, une première portion (68) de la deuxième surface fournissant la première pression de contact de manière substantiellement uniforme le long de la première portion (60) de la première surface (56) ;
caractérisé en ce que
une portion de région d'espacement (62-1) de la première surface aboute une extrémité de la première portion (60) de la première surface (56) et peut se mettre en prise avec le cylindre et cet au moins un composant d'imprimante le long de ladite région d'espacement (62) à une deuxième pression de contact ;
et une portion de région d'espacement (62-2) de la deuxième surface fournissant la deuxième pression de contact le long de la portion de région d'espacement (62-1) de la première surface qui est supérieure à la première pression de contact, et
dans lequel la deuxième surface (58) inclut une paire de nervures en saillie (66-1, 66-2), chaque nervure ayant une première rigidité le long de la première portion (68) de la deuxième surface afin de fournir la première pression de contact et une deuxième rigidité le long de la portion de région d'espacement (62-2) de la deuxième surface qui est supérieure à la première rigidité afin de fournir la deuxième pression de contact.

2. L'élément d'étanchéisation de la revendication 1, dans lequel une portion de chaque nervure (66-1, 66-2) le long de la première portion (68) de la deuxième surface (58) a une aire en coupe transversale qui est inférieure à l'aire en coupe transversale d'une portion de chaque nervure le long de la portion de région d'espacement (62-2) de la deuxième surface.

3. L'élément d'étanchéisation de la revendication 2, dans lequel l'aire en coupe transversale de chaque nervure (66-1, 66-2) dans la portion de région d'espacement (62-2) est supérieure autour d'un espacement formé entre le cylindre (42) et cet au moins un composant d'imprimante (44) au sein de la région d'espacement.

4. L'élément d'étanchéisation de la revendication 3, dans lequel l'aire en coupe transversale de chaque nervure (66-1, 66-2) au sein de la portion de région d'espacement (62-2) de la deuxième surface (58) augmente progressivement en taille depuis l'aboutement de la portion de région d'espacement de la deuxième surface avec la première portion (68) de la deuxième surface jusqu'à une taille maximale au niveau environ de l'espacement.

5. L'élément d'étanchéisation de la revendication 1, comprenant de surcroît au moins une nervure transversale (80) au sein de la portion de région d'espacement (62-2) de la deuxième surface (58) raccordant entre elles l'une desdites nervures en saillie (66-1, 66-2) et la deuxième surface.

6. L'élément d'étanchéisation de la revendication 5, dans lequel cette au moins une nervure transversale (80) comprend deux nervures transversales (82, 84) espacées l'une de l'autre sur des côtés opposés de l'espacement (62), chacune des deux nervures transversales raccordant entre elles ladite une nervure desdites nervures en saillie (66-1, 66-2) et la

deuxième surface (58).

7. L'élément d'étanchéisation de la revendication 5, dans lequel cette au moins une nervure transversale (80) comprend deux nervures transversales (66-1, 66-2), une première nervure d'entre les deux nervures transversales raccordant entre elles une première nervure d'entre lesdites nervures en saillie et la deuxième surface et une deuxième nervure d'entre les deux nervures transversales raccordant entre elles une deuxième nervure d'entre lesdites nervures en saillie et la deuxième surface.

8. L'élément d'étanchéisation de la revendication 1, dans lequel cette au moins une rainure (90) de la première surface (56) est oblique par rapport aux côtés de la première portion (60) de la première surface afin d'éloigner en le repoussant le toner d'une extrémité (43) du cylindre (42) durant une rotation de cylindre et est parallèle aux côtés de la portion de région d'espacement (62-1) de la première surface (56).

9. L'élément d'étanchéisation de la revendication 1, dans lequel la deuxième pression de contact est entre 1,5 et 5 fois supérieure à la première pression de contact.

10. L'élément d'étanchéisation de la revendication 1 dans lequel :

la première surface (56) doit de surcroît pouvoir se mettre en prise avec le cylindre (42) et un deuxième composant d'imprimante (48), le cylindre et le deuxième composant d'imprimante formant une deuxième région d'espacement (64) entre ceux-ci, une deuxième portion de région d'espacement (64-1) de ladite première surface aboutant une deuxième extrémité de la première portion (60) de la première surface et pouvant se mettre en prise avec le cylindre (42) et le deuxième composant d'imprimante (48) le long de la deuxième région d'espacement (64) à une troisième pression de contact ; et
la deuxième surface (58) décalant de surcroît la première surface (56) devant pouvoir être mise en prise avec le cylindre (42) et le deuxième composant d'imprimante (48), une deuxième portion de région d'espacement (64-2) de la deuxième surface fournissant la troisième pression de contact le long de la deuxième portion de région d'espacement (64-1) de la première surface qui est supérieure à la première pression de contact.

11. L'élément d'étanchéisation de la revendication 10, dans lequel chaque nervure (66-1, 66-2) a de surcroît une troisième rigidité le long de la deuxième portion de région d'espacement (64-2) de la deuxième surface (58) qui est supérieure à la première rigidité afin de fournir la troisième pression de contact, et dans lequel au sein des premières portions de régions d'espacement (62-1, 62-2) des première et deuxième surfaces (56, 58) au moins une nervure transversale (80) raccorde entre elles chaque nervure en saillie et la deuxième surface (58), et au sein des deuxièmes portions de régions d'espacement (64-1, 64-2) des première et deuxième surfaces (56, 58) au moins une autre nervure transversale (80) raccorde entre elles chaque nervure en saillie et la deuxième surface (58).

12. L'élément d'étanchéisation de la revendication 10, dans lequel cette au moins une rainure (90) de la première surface (56) est oblique par rapport aux côtés de la première portion (60) de la première surface afin d'éloigner en le repoussant le toner d'une extrémité (43) du cylindre (42) durant une rotation de cylindre et est parallèle aux côtés de la première portion de région d'espacement (62-1) et de la deuxième portion de région d'espacement (64-1) de la première surface.

13. L'élément d'étanchéisation de la revendication 1, situé au sein d'une cartouche d'imprimante.

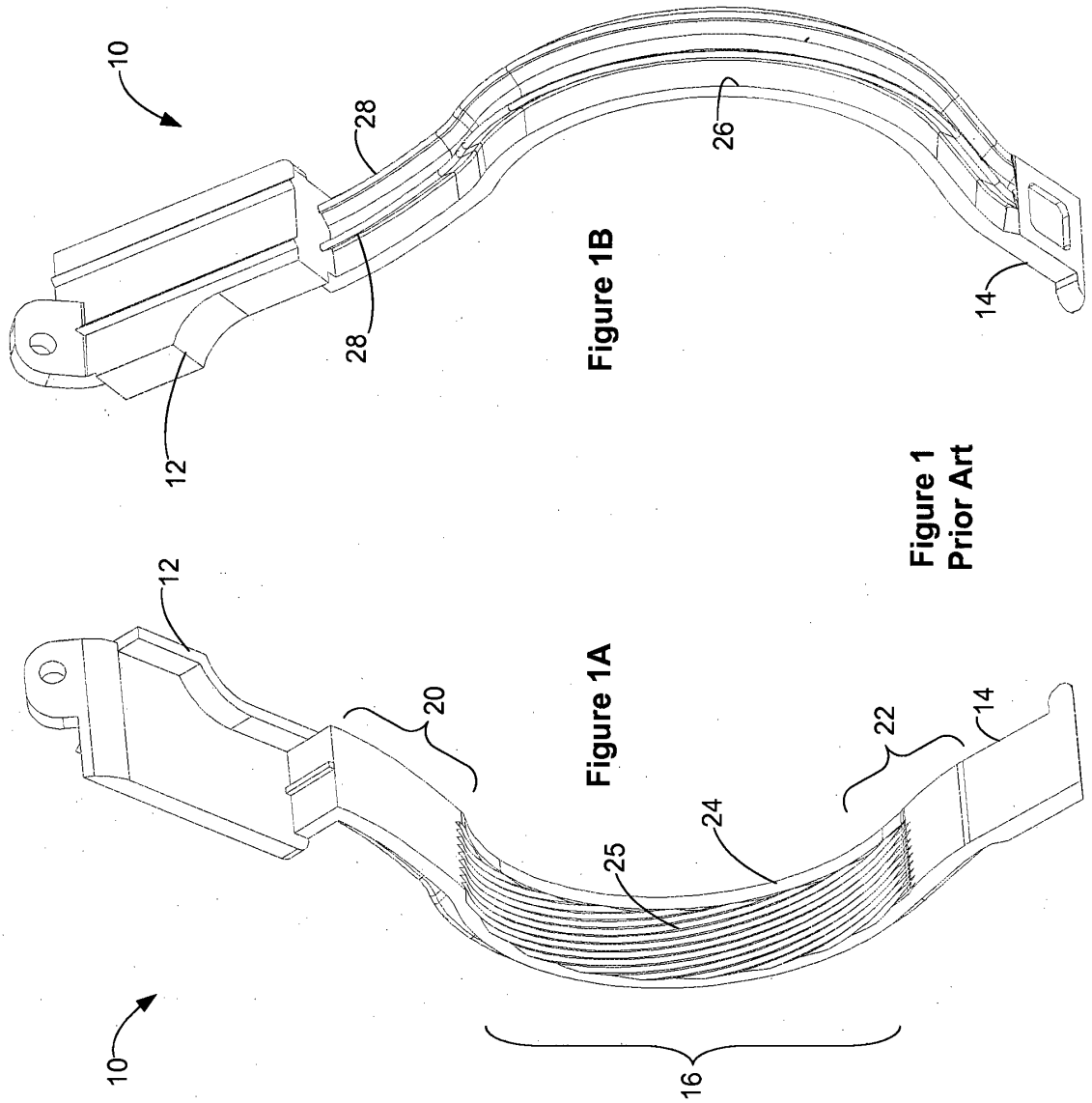

Figure 1B

Figure 1A

Figure 1
Prior Art

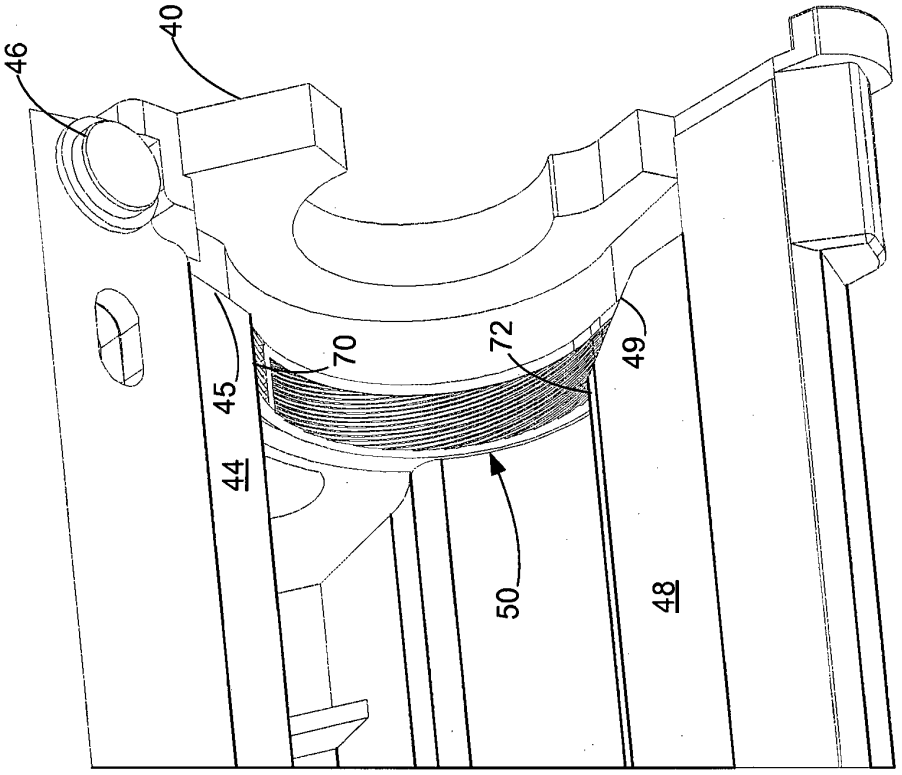

Figure 3

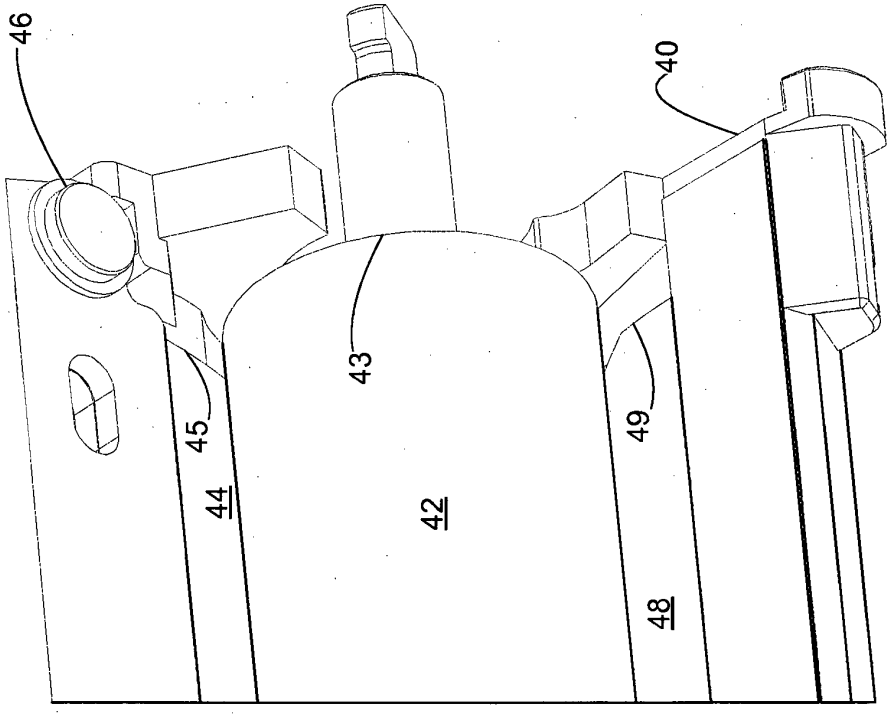

Figure 2

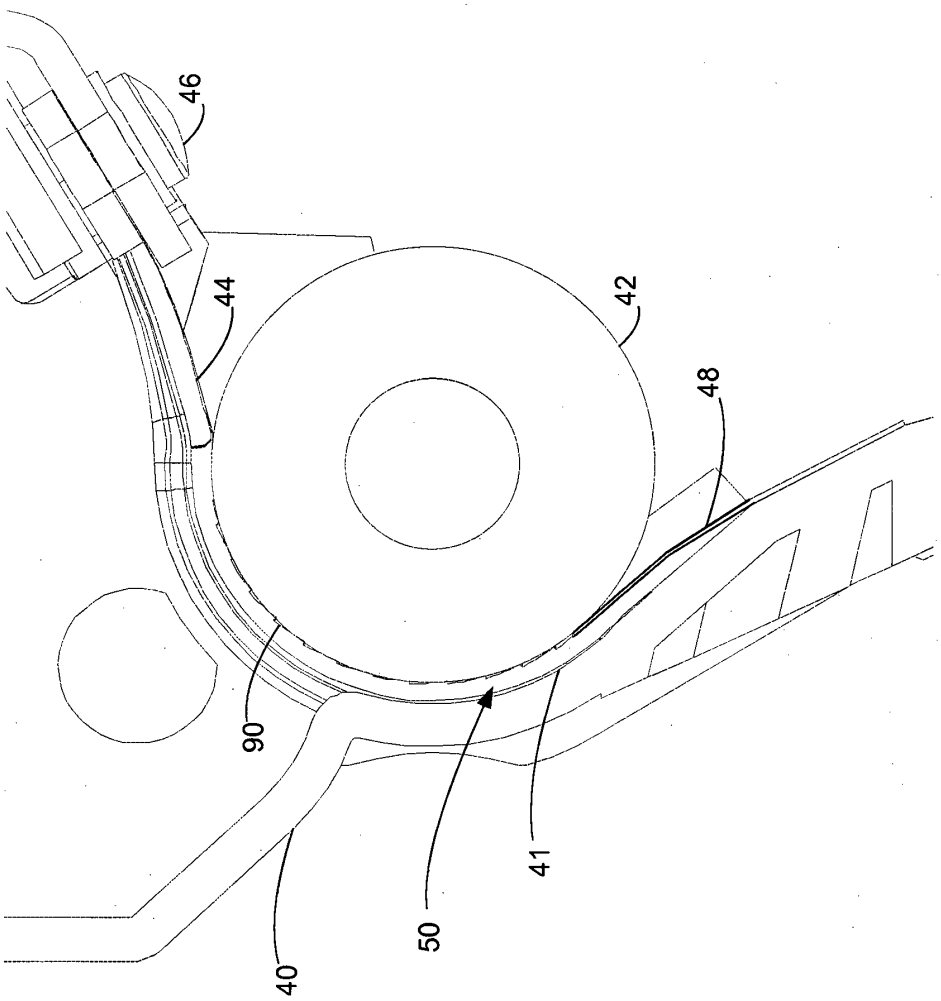

Figure 4

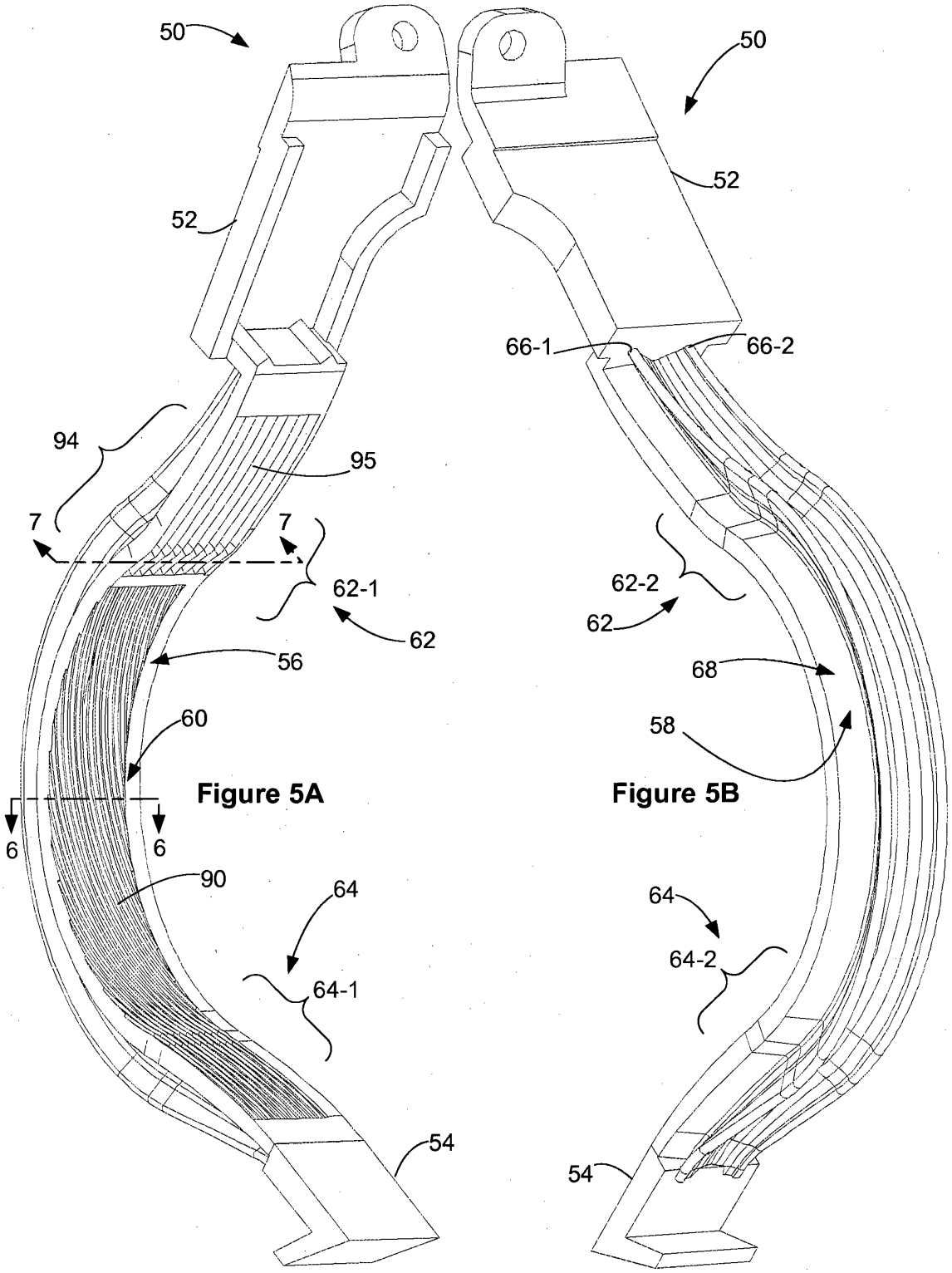

Figure 5A

Figure 5B

Figure 5

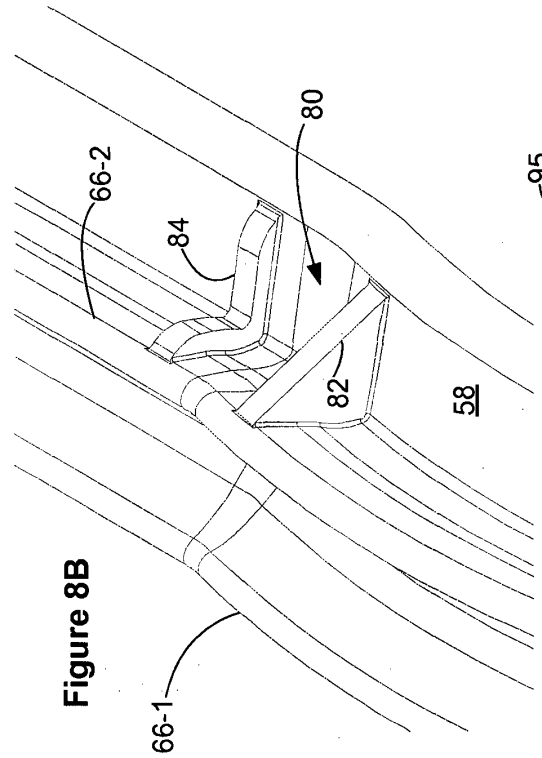

Figure 8B

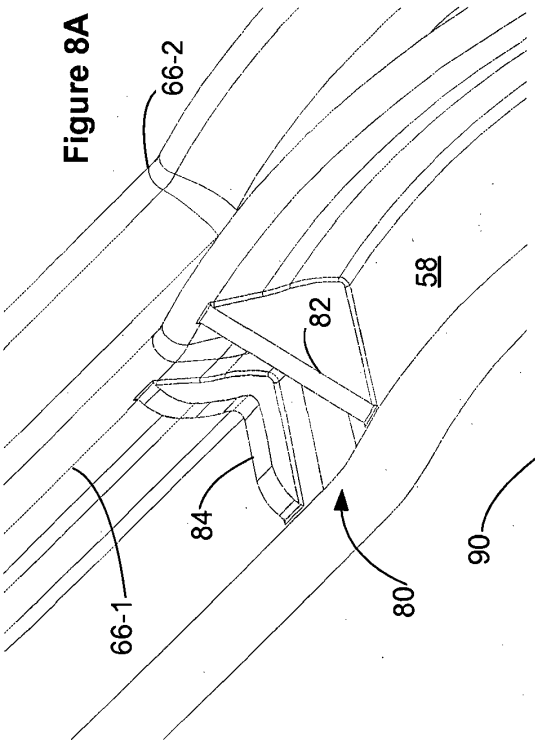

Figure 8A

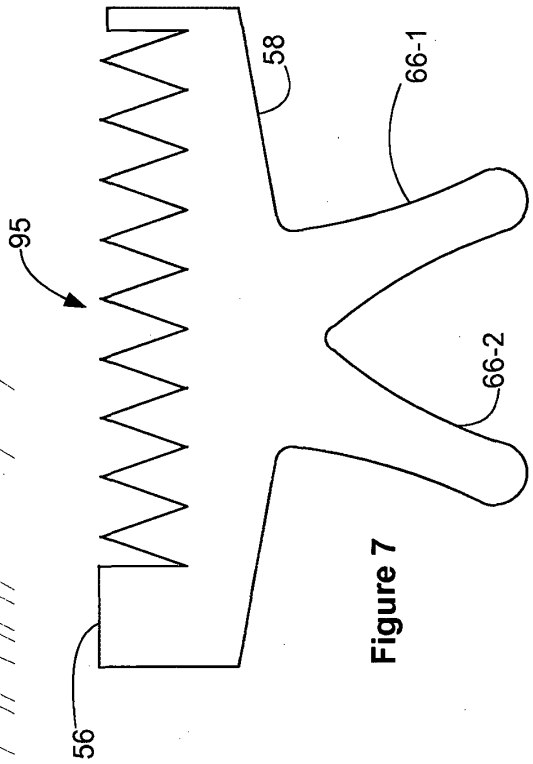

Figure 7

Figure 6

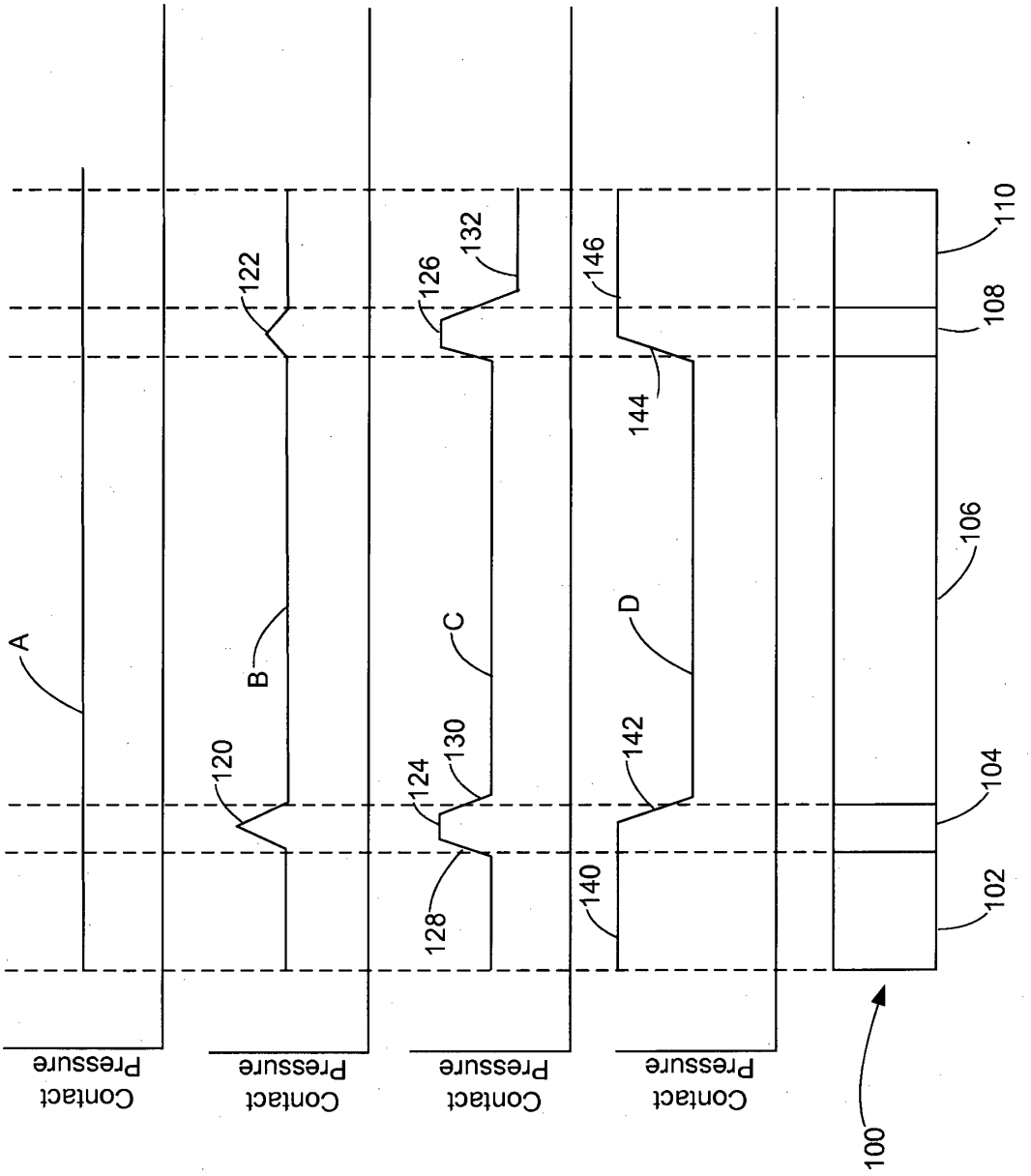
Contact Pressure
Contact Pressure
Contact Pressure
Contact Pressure
A
B
C
D
120
122
124
126
128
130
132
140
142
144
146
100
102
104
106
108
110

Figure 9

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 7623807 B2, Carter, II **[0003]**